Table 24

Effects of Selected Pollutants that Occur in the Bay/Delta Estuary

Pollutant	Effects	Comments
Arsenic	Carcinogenic/mutagenic. Toxicity dependent on chemical form. Acutely toxic to most marine organisms. (1, 2)	Effect on estuary biota unknown. Probably a pollutant of less concern. (9)
Cadmium	Carcinogenic/mutagenic/teratogenic. **Highly toxic in aquatic environments.** Bioaccumulates up to 250,000 times concentration in water. Of exceptional toxicity to mammals, including humans. (1, 3, 4)	**A pollutant of greatest concern. Ubiquitous in Bay. Levels in biota warrant health concern and further investigation. (1, 9)**
Chromium	Carcinogenic/mutagenic/teratogenic. Strongly accumulates in sediments and biota. Detrimental effects in biota at levels in water of 10 ppb. Accumulates highly in sediments. (1, 5, 6)	Poorly characterized in estuary. Large industrial source in Suisun Bay area. Concentrations in Bodega and Tomales Bay sediments also high. Elevated levels cause for concern and further investigation. (1, 3)
Copper	Chronically toxic to marine organisms at concentrations in water of .01-10.0 ppm. Acutely toxic at concentrations in water greater than 0.1 ppm. Bioaccumulates in shellfish up to 30,000 times concentration in water. Highly bioavailable in the estuary. (1, 3, 4, 5)	**A pollutant of greatest concern. Elevated levels in water, sediment, and biota cause for further investigation. (3, 9)**
Lead	Carcinogenic/teratogenic. Chronically toxic to marine organisms at concentrations in water of 0.1 ppm. Bioaccumulates readily. Highly toxic to mammals. (1, 3, 4)	Given moderate toxicity and relatively even distribution, a problem only at specific sites. (3)
Mercury	Teratogenic. **Most toxic of all trace elements.** Effects occur at low parts per billion level. Wide range of acute and chronic toxicities to aquatic biota. Chronic toxicity to marine organisms occurs at concentrations in water of 1 ppb. Bioaccumulates in some aquatic biota at levels 100,000 times that in water. (1, 3, 4)	**Possibly a pollutant of greatest concern. Given effect and high concentrations in biota, further investigation warranted. (3, 9)**
Nickel	Carcinogenic/mutagenic. Chronically toxic in water at levels greater than 0.1 ppm. Acutely toxic at concentrations above 1.0 ppm. (1, 3)	Poorly characterized in estuary. Enrichment in sediments and biota is localized. (3)
Selenium	Teratogenic. Toxicity depends greatly on chemical form. Toxic effects occur at concentrations of 10 ppb in freshwater, 1 ppm dry mass in sediments, and 0.3 ppm wet weight in shellfish. (1, 3, 4)	**A pollutant of greatest concern. Effects on biota, especially those higher in food web, and levels in water and biota warrant further investigation. (3, 9)**
Silver	**One of the most hazardous trace elements,** ranking second after mercury. Retards growth of sea urchin larvae at levels in water of 0.36 ppb. KillsAmerican oysters at levels in water of 6 ppb. Kills clam embryos at levels in water of 13 ppb. Bioaccumulates at levels up to 3,000 times its concentration in water. (1, 4)	**A pollutant of greatest concern. High toxicity and levels in Central and South bay sediment and shellfish warrant further investigation. (3, 9)**
Tributyltin	Mutagenic/teratogenic. Toxicity highly dependent on chemical form. Toxic to aquatic biota at the parts per trillion range. Bioaccumulates in some biota to levels thousands of times greater than in water. (1, 3, 5)	Levels at marinas and harbors are sufficiently high to cause toxic effects in sensitive biota. (1)
Zinc	Moderately toxic. Chronically toxic to marine organisms at concentrations in water of about 0.05 ppm. Acute toxicity to marine and freshwater animals occurs at concentrations in water above 0.1 ppm. Bioaccumulates in shellfish to levels 100,000 times that of water. (1, 3, 4)	Toxicity and concentrations in sediment and biota indicate minor concern. (3).
PAH	Carcinogenic/mutagenic/teratogenic. Toxicity varies among chemicals. May bioaccumulate. (1, 3)	Poorly characterized in estuary; sampling has occurred only since 1983. Effects on biota possible, but not well defined. (1, 7)
DDT	Carcinogenic/teratogenic. **Highly toxic and extremely persistent.** Effects occur in many species of biota, and over a large range of concentrations. Causes reproductive impairment in fish and birds. Bioaccumulates at levels up to one million times that in water. (1, 4, 10)	Although contamination levels seem to have dropped in biota since since early 1980's, this chemical continues to enter the estuary from Central Valley soils. Localized contamination continues, especially at Lauritzen Canal. Overall impact on estuary biota is probably low. (3, 7)
PCB	Carcinogenic. More persistent than DDT. Effects occur at extremely low concentrations. Bioaccumulates at levels up to one million times than in water. May affect reproduction in birds and mammals. (1, 4)	**Elevated levels in sediments and tissue are cause for concern. Increasing levels in black-crowned night heron linked to decreasing embryo weights and thin eggshells. (1, 8)**

Sources: (1) SWRCB, 1990; (2) PSWQA, 1988; (3) Phillips, 1987; (4) Callahan et al., 1979 in CBE, 1987; (5) CBE, 1987; (6) Eisler, 1986a in Phillips, 1987; (7) Long et al., 1988; (8) Davis et al., 1991; (9) Luoma + Phillips,1988; (10) SCCWRP,1988